



WOOL
HARVESTING
NOTE

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TIMBER: SPECIES AND PROPERTIES

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INTRODUCTION

Timber is a versatile material readily available in most areas, and varieties of commercial significance may even grow on local properties. It can be used in natural state, or machined to give uniformity of shape and size. In addition, it can be worked on site with relatively simple tools.

When considered for sheep yards, the main properties of importance are strength and durability.

This Wool Harvesting Note provides some general information on timber and its uses, but is particularly oriented towards its use for fences.

STRENGTH OF TIMBER

When used in a general sense, the term "strength" covers all the mechanical properties of a particular timber. A strong timber has a high resistance to bending, to compression, and to shear.

In general, the higher the density (mass per unit volume) the greater the strength.

STRENGTH GROUPS

Because of the large number of timber species in common use for structural purposes, it is convenient to combine them into groups, the species in each group having similar strength properties. There are seven strength groups for unseasoned or green timber; S1 being the group with greatest strength, and S7 being the group with lowest strength properties. Strength groups for seasoned or dry timber are represented by the symbol SD, and there are eight such groups.

Table 1 shows a list of selected Australian and imported timbers, and the strength group of each is shown for both unseasoned and seasoned condition.

STRESS GRADING

Within each strength group there are variations arising from several factors. The particular species, the growing conditions, the position within the tree from which a piece of timber is cut, and the number and type of imperfections are some of the factors which give rise to variations in strength between pieces of timber cut from species within the same strength group.

For structural work where the strength of the timber is of major importance, there are four grades within each strength group. The classification of a piece of timber may be carried out by either visual or mechanical grading. The piece of timber can then be marked with an F number to indicate the basic working stress in bending which is essential data for engineering design computations. A stress grade such as "F8" indicates that, for the piece of timber so marked, the basic working stress in bending is approximately 8 MPa (megapascals).

The relationship between the strength groups and the stress grades is given in Table 2. To assist in identifying the various stress grades, a colour code is used. Details are given in Table 3.

SAPWOOD AND HEARTWOOD

Sapwood is the band of living cells just under the bark of the tree, and is the conducting and storing tissue vital to growth. It varies in width depending on the type and size of the tree. Because of the presence of materials necessary for growth, sapwood attracts decay fungi and some borers.

Sapwood generally converts to heartwood as the tree ages. The cells are then no longer living tissue, but act as storage areas for waste materials of the growth process. Cavities between cells become blocked with this material which has a bearing on the colour and durability of the timber, and makes heartwood difficult to impregnate with preservatives.

DURABILITY AND SUITABILITY

Durability refers to the natural resistance of sound timber to destruction by organisms such as decay (fungal attack), termites (white ants) and borers.

Decay occurs when fungi use damp wood as a source of food. When the moisture content of wood is kept below 20%, decay is not a problem. It can remain a problem for timber in contact with the ground or exposed to the weather.

Attack by termites can be prevented by the use of chemical soil treatments or physical barriers. The objective is to prevent the subterranean termites from making contact with the timber. This can be readily achieved by using sound building practices for structures using timber above ground. For timber in ground contact, the heartwood of several species has been found to have considerable natural resistance to termite attack, e.g. cypress pine, ironbark, western red cedar, and wandoo. Using such timbers as these for posts and stumps minimises the likelihood of termite attack.

There are a number of borers which make holes in timber, but the commonest is the Lyctus beetle (powder post beetle). This beetle attacks only the sapwood of certain timber species. The Lyctus beetle and its effects are of economic importance in New South Wales and Queensland where the use of sapwood susceptible to attack is controlled by law. Full details are given in the N.S.W. Timber Marketing Act, and the Queensland Timber Users Protection Acts. There are relatively simple treatments available to protect susceptible timber against these insects. Table 1 indicates the Lyctus susceptibility of the sapwood of numerous species of timber.

The durability properties of various species of timber in respect of decay and insect attack, together with weathering characteristics, allows timbers to be rated according to their suitability for certain applications. Five suitability classes have been described, and the rating for each species is given in Table 1, the classes being defined at the end of the Table. It must be remembered that the classification applies to the heartwood of the species, the sapwood of all species being taken as non-durable.

SHRINKAGE

As unseasoned or green timber dries, shrinkage occurs. This may cause splitting, cracking and warping, and joints between members may become loose giving loss of strength or rigidity.

The general degree of shrinkage expected from various species is shown in Table 1 being classed as high, medium or low.

PRESERVATIVE TREATMENTS

The durability of many timbers can be improved by appropriate treatment.

Immunisation refers to the process of applying a preservative which protects the sapwood of a timber species against the Lyctus borer. In N.S.W. and Queensland there are legal requirements relating to the sale and use of such timber, and so such processes are widely used in these States. Cutting, drilling, etc. can be safely carried out after treatment.

Impregnation refers to the process whereby the timber is treated with preservative by a pressure system. It is the commonest process when preservative oils such as creosote are used. Pressure processes must be used when fixed waterborne salts such as CCA (copper-chrome-arsenic) are used as the preservatives.

The heavy oil preservatives (such as creosote) are used when protection against weathering is important. Treated timber is usually difficult to paint successfully, and retains a distinctive colour and odour.

The timber treated with the waterborne salts (such as CCA) is odourless, non-toxic to humans and animals, and capable of being painted. These preservatives give little or no protection against weathering.

Both types of preservatives give reliable protection against all types of biological attack and degradation.

The sapwood of most species can be treated to give a long service life, but heartwood is generally resistant to impregnation.

ORDERING

Metric units are used, the length of the timber being given in metres and the cross section dimensions in millimetres.

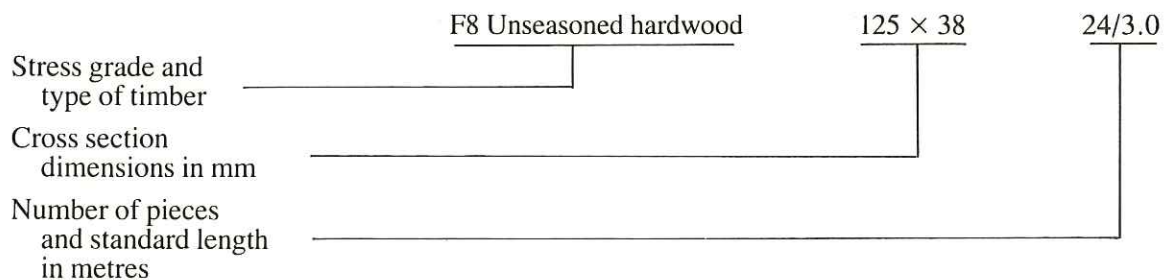
Standard lengths begin at 1.8 metres and increase in 0.3 metre increments up to about 6.0 metres.

Typical sizes for unseasoned hardwood are given in Table 4, for seasoned radiata pine in Table 5, and for structural rounds such as posts or poles in Table 6. Additional sizes may be obtained by special arrangement.

When ordering structural timber it is necessary to give:

- the stress grade and type of timber, e.g. F8 unseasoned hardwood.
- the section size in millimetres, giving the greatest dimension first, e.g. 100 × 38,
- the number of pieces for each standard length, e.g. 10/2.4 means 10 pieces each 2.4 metres long.

A typical specification would appear as follows:



AVAILABILITY

It is necessary to check with local timber suppliers to ascertain the availability of both species and common sizes. In some cases, timbers suitable for structural purposes around the farm may grow on the property. These can be used in natural form for some applications, or broken down at a local sawmill if specific sizes or shapes are required.

TABLE 1
Data on Selected Australian and Imported Timbers

Standard Trade Name	Typical Density kg/m ³		Strength Group		Lyctus Susceptibility	Suitability Class	Shrinkage	States Where Grown
	Green	12% MC (1)	Green	Seas.				
Ash, Crow's	1120	940	S2	SD3	S	3	L	NSW, Q'ld.
Ash, hickory	1120	980	S3	SD3	S	3	L	Q'ld.
Ash, mountain	1040	670	S4	SD3	R	1B	H	Tas., Vic.
Ash, silvertop	1200	850	S3	SD3	R	2	H	NSW, Tas., Vic.
Blackbutt	1120	880	S2	SD2	R	2	H	NSW, Q'ld.
Blackbutt, West Aust.	1120	850	S4	SD5	S	3	H	WA.
Bloodwood, brown	1200	1020	S3	SD4	S	4	M	NSW, Q'ld.
Bloodwood, red	1120	880	S3	SD4	S	4	L	NSW, Q'ld.
Box, black	1200	1100	S3	SD3	S	4	M	NSW, Q'ld., Vic.
Box, brush	1200	900	S3	SD3	R	2	H	NSW, Q'ld.
Box, coast grey	1280	1100	S2	SD2	S	4	M	NSW, Vic.
Box, grey	1200	1120	S2	SD3	R	4	M	NSW, Q'ld., Vic.
Box, red	1200	1060	S3	SD4	S	3	M	Vic.
Box, white	1200	1100	S2	SD2	R	3	M	NSW.
Box, yellow	1280	1070	S3	SD4	R	4	M	NSW, Vic.
Gidgee		1250	S1*	SD2*		4	L	Q'ld.
Gum, forest red	1200	960	S3	SD4	S	3	H	NSW, Q'ld., Vic.
Gum, grey	1280	1060	S2	SD2	R	4	H	NSW, Q'ld.
Gum, manna	1120	770	S4	SD4	S	1	H	NSW, SA, Tas., Vic.
Gum, river red	1200	910	S5	SD6	S	3	H	NSW, Q'ld., SA, Vic.
Gum, spotted	1200	990	S2	SD2	S	2	M	NSW, Q'ld.
Ironbark, grey	1200	1090	S1	SD1	R	4	H	NSW
Ironbark, narrow-leaved red	1280	1070	S2	SD3	R	4	M	NSW, Q'ld.
Ironbark, red	1280	1090	S2	SD3	S	4	M	NSW, Vic.

Refer to Notes following this Table.

TABLE I
(Cont'd)

Standard Trade Name	Typical Density kg/m ³		Strength Group		Lyctus Susceptibility (2)	Suitability Class (3)	Shrinkage (4)	States Where Grown
	Green	12% MC (1)	Green	Seas.				
Jarrah	1120	820	S4	SD4	R	3	M	WA.
Karri	1200	900	S3	SD2	R	1B	H	WA.
Mahogany, red	1200	960	S2	SD3	S	3	M	NSW, Q'ld.
Mahogany, southern	1200	910	S2	SD3	R	2	H	NSW, Vic.
Mahogany, white	1280	960	S2	SD3	R	4	M	NSW, Q'ld.
Messmate, stringybark	1120	770	S3	SD3	S	2	H	NSW, SA, Vic., Tas.
Pine, radiata	880	540	-	SD6	R	1A	L	NSW, SA, Vic., Tas., WA.
Pine, white cypress	880	670	S6	SD7	R	4	L	NSW, Q'ld.
Stringybark, red	1200	900	S3	SD4	S	2	H	Vic.
Stringybark, white	1120	850	S3	SD3	R	3	H	NSW, Vic.
Stringybark, yellow	1200	880	S3	SD3	R	3	M	NSW, Vic.
Tallowwood	1200	990	S2	SD2	S	4	M	NSW, Q'ld.
Turpentine	1200	940	S3	SD3	R	4	H	NSW, Q'ld.
Wandoo	1280	1100	S2	SD3	R	4	L	WA.
<u>IMPORTED TIMBERS</u>								
Cedar, Western red	-	370	S7	SD8	R	3	L	
Douglas fir (oregon)	640	560	S5	SD5	R	1B	L	
Keruing	-	720-800	S3	SD3	S	2	H	
Kwila (Merbau)	-	830	S2	SD2	S	4	L	
Ramin	-	650	S5	SD5	S	1B	M	

Refer to Notes on following page.

NOTES RELATING TO TABLE 1

- (1) Typical value at 12% moisture content.
- (2) The rating given is the susceptibility of the sapwood to lyctus beetle attack.
R = Resistant S = Susceptible
- (3) "Suitability" is an indication that the heartwood of a particular species has a natural durability which makes it suitable for use in the defined suitability classes. Timbers of a given suitability class have a durability which qualifies them for that class or any lower class. The reverse does not apply and suitability can only be altered if the timber is subject to an approved preservative treatment.
1A = Timber for inside use.
1B = Timber used above ground, exposed to the weather but adequately waterproofed and maintained in that condition.
2 = Timber used above ground exposed to the weather and unprotected.
3 = Timbers which are badly ventilated or laid on concrete, or non-structural components in ground contact.
4 = Members supporting structures either in ground contact or laid on concrete.
- (4) H = High shrinkage (over 8%)
M = Medium shrinkage (5 to 8%)
L = Low shrinkage (less than 5%)
Values are for tangential shrinkage from green to 12% moisture content.

* Estimated classification.

TABLE 2
Relationship Between Strength Groups and Stress Grades

(a) For unseasoned (green) timber.

Strength group	Stress grades			
	No. 1 Structural	No. 2 Structural	No. 3 Structural	No. 4 Structural
S1	F27	F22	F17	F14
S2	F22	F17	F14	F11
S3	F17	F14	F11	F 8
S4	F14	F11	F 8	F 7
S5	F11	F 8	F 7	F 5
S6	F 8	F 7	F 5	F 4
S7	F 7	F 5	F 4	F 3

(b) For seasoned timber.

Strength group	Stress grades			
	No. 1 Structural	No. 2 Structural	No. 3 Structural	No. 4 Structural
SD1	F43	F34	F27	F22
SD2	F34	F27	F22	F17
SD3	F27	F22	F17	F14
SD4	F22	F17	F14	F11
SD5	F17	F14	F11	F 8
SD6	F14	F11	F 8	F 7
SD7	F11	F 8	F 7	F 5
SD8	F 8	F 7	F 5	F 4

TABLE 3
Colour Markings Representing Common Stress Grades

Stress grade	Colour Code
F 4	Red
F 5	Black
F 7	Blue
F 8	Green
F11	Purple
F14	Orange
F17	Yellow
F22	White

TABLE 4
Typical Size Range for Unseasoned Hardwood

SIZE RANGE	
Thickness (mm)	Width (mm)
	50 75 100 125 150 175 200 225 250 300
25	● ● ● ● 0
38	● ● ● ● ● ● ● ● ● ●
50	0 ● ● ● ● 0 ● ● ● ●
75	0 ● ● 0 0 0 0

● - Commonly available sizes.
0 - Additional sizes readily available from leading producers.

NOTES

1. Size stated is size off-saw.
2. Lengths up to 6.0 m are readily available. Lengths above 6.0 m and up to 7.5 m are generally obtainable in larger sizes from leading suppliers although advance orders may be required.

TABLE 5
 Typical Size Range for Seasoned Radiata Pine

SIZE RANGE											
Thickness (mm)	Width (mm)										
	19	35	42	70	90	120	140	170	190	240	290
35			0	●	●	●	●	0	●	0	
45				●	●	●	●	0	●	0	0
70				●	●		0		0		
90					●						

- - Commonly available sizes
- 0 - Additional sizes in limited supply

NOTES

1. Size stated is finished size.
2. Lengths up to approx. 6 metres are normally available.
3. Tolerances: + 3 mm, - 0 mm on finished width and thickness.
4. The moisture content of seasoned material (at time of delivery) shall not be less than 12% or more than 15%.
5. Some suppliers can provide the majority of sizes in CCA preservative treated radiata pine (pressure treatment with copper-chrome-arsenate salts). Treated material is usually recognisable by its pale green colour.

CCA treated material presents no hazards to human beings or domestic animals under normal conditions of use, but off-cuts should not be burnt in enclosed stoves, fireplaces or as fuel for barbecues.

TABLE 6

Typical Size Range for Structural Rounds (Posts and Poles)

Length (m)	Diameters (mm)				
	50-75	75-100	100-125	125-150	150-175
1.8	●	●	●	●	0
2.1	0	0	●	●	0
2.4	0	●	●	●	●
2.7	0	0	●	●	●
3.0	0	●	●	●	●
3.6	0	●	●	●	●
4.2			●	●	●
4.5			0	●	0
4.8			0	●	0

● - Commonly available sizes.

0 - Additional sizes normally available.

NOTES

1. By far the most extensive range of structural rounds is that of Radiata Pine, preservative pressure treated with copper-chrome-arsenate salts (CCA). Pressure treatment with creosote is also used where its physical properties are not a disadvantage (e.g. oiliness).
The size range for CCA treated Radiata Pine rounds is extensive and varies between suppliers. The table shows a typical range although the sizes are not necessarily the only ones available.
2. Large diameters (up to 275 mm) and long lengths (up to 11 m) are feasible but not easily obtainable.
3. Some intermediate lengths are available.